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Electronic Brokerage and Electronic Auction: The Impact of IT on Market Structures

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Abstract

Great progress has been made over the past few years in the study of the impact of IT on inter-firm trade relationships and markets. Most works in this area focus on firm boundaries (purchasing or outsourcing) or buyer-seller relations in general. Although these works are based on reasonable theoretical grounding and many of them have been tested empirically, they do not provide a complete explanation for why different forms of electronic markets have emerged. This article identifies two types of electronic markets - electronic brokerage and electronic auction - by investigating the impact of IT on transaction costs (search, coordination and trade settlement costs) under four different market structures. The economic forces behind the introduction of electronic marketplaces, which either change or support existing market structures, are analyzed along these two market dimensions. Social and organizational barriers to successful implementation of electronic market systems are also discussed.

1. Introduction

Over the past few years authors have advocated increasing the use of Interorganizational Information Systems (IOS) as the costs of electronic communications fall and as the ability to convey complex information through networks increase. IOS have the potential to affect all aspects of market and trade relationships, including search, negotiation, contract formation and payment. Transaction cost economics has played an essential role in assessing the impacts of information technologies (IT) on firm and market structures. Transaction cost economics addresses the question of whether a coordination will be managed through independent firms contracting in markets or through the hierarchy of a single firm [30]. Two types of IOS have thus been identified that are made possible by the use of IT: electronic markets and electronic hierarchies both coordinate the flow of materials through adjacent steps in the value-added chain [21].

Early studies of the impact of IT on transaction costs focus on firm size or boundaries, that is, whether to produce or to outsource [13, 21]. They suggest that IT will lead to the increased use of market coordinations (outsourcing) among firms as it lowers transaction costs. As many authors have pointed out, however, firms using IOS have often produced new forms of organization such as networks and value-adding partnerships, instead of having simply increased firms' reliance on markets. In an attempt to explain this phenomenon, known as the *move to the middle hypothesis*, several authors have expanded market coordination costs into further dimensions. Clemons, Reddie and Row argue that when firms increase outsourcing, they will do so with a limited number of long-term trading partners due to increased opportunistic and operational risks [5]. Bakos and Brynjolfsson include the concept of non-contractible investments in coordination costs to explain why buying firms limit the number of suppliers [3].

All of these works are based on solid and reasonable theoretical grounding and many of them are empirically tested. However, they are limiting when one is looking at why different forms of electronic markets have emerged. They share in common a view that the market is a simple abstract by which multiple firms purchase or sell a certain group of goods. In general, markets have complex structures consisting of several players with different roles. As a result, various forms of electronic markets have emerged: some systems have completely changed existing market structures, while other systems have been introduced to support current markets. The market institutional form that these systems intend to create is also diverse: electronic markets can serve either as broker firms or as auction organizations between buying and selling firms (or individuals).

This paper analyzes the economic forces behind these different forms of electronic markets by investigating transaction costs and market structures in detail. We decompose transaction costs into search costs, coordination costs and trade settlement costs to study the role of electronic markets in different trade phases. Moreover, four market structures are identified to help speculate on the impact of IT on market structural changes. The paper dichotomizes the electronic marketplace into electronic brokerage and electronic auction, and investigates how these two forms of electronic marketplace change or support different market forms. Thus, this paper addresses neither the question of firm boundaries nor that of the appropriate number of trading partners in buyer-seller

relationships. It assumes that the decision to outsource has already been made, and then proceeds to determine which form of electronic markets are most appropriate for buying and selling firms.

The paper is organized as follows. Section 2 classifies markets into four structures according to how traders locate their trading partners. This market taxonomy is central to the subsequent analysis of the impact of IT on market structures. In Section 3, transaction costs are discussed along the three trade phases: search, coordination and settlement, and electronic markets are dichotomized into electronic brokerage and electronic auction. This is followed by two sections that analyze economic incentives behind the implementation of these two types of electronic market systems. Section 4 investigates circumstances where electronic markets shift market structures, while Section 5 looks into systems that support or compete with existing markets, instead of changing market structures. In Section 6, several barriers to the successful deployment of electronic markets are discussed from social and organizational perspectives. Section 7 summarizes the major conclusions.

2. Market structures

There are several alternative ways of classifying market structures. Since electronic markets aim to help traders find trading partners, it may be appropriate to classify the market structures according to how traders locate their counterparts [12]. In this case, we can identify four different types of market: (1) the direct search market, where traders must seek out compatible trading partners by themselves, (2) the brokered market, where traders employ agents to conduct that search, (3) the dealer market, where traders complete their transactions by trading with dealers who hold their own inventories and are always willing to buy and sell, and (4) the auction market, where traders transact directly against the orders of other traders by communicating through a single centralized intermediary.

2.1 Direct search markets

The markets of the original economic concept are those where buyers and sellers must search each other out directly. Since an individual trader pays for the full cost of locating and bargaining with a compatible trading partner, there is no strong incentive to conduct a complete search for the best trading partner. Failure to conduct a thorough search may cause transactions to occur some distance from the best possible deal. Without any intermediary, all the tasks associated with bargaining and negotiation is undertaken by individual traders.

2.2 Brokered markets

In this market, brokers offer specialized search services to buyers and sellers. For a fee, brokers will try to find compatible trading partners for their clients. Since brokers are frequently in contact with many market participants on a continuing basis, they are likely to know how sellers' product offerings or buyers' bids can be bettered off. Brokers provide these services at a cheaper price than is possible in a direct search market. Their extensive contacts provide them with a pool of information on products and prices which individual traders could not economically duplicate. By charging a commission less than the cost of direct search, they give traders an incentive to make use of their services.

2.3 Dealer markets

Dealers maintain their own stock of goods, and buy for, or sell for, their inventory at their quoted prices. Dealer markets eliminate the need for time-consuming searches for trading partners, because traders know they can buy or sell immediately at the prices quoted by a dealer. Although certain product groups, such as automobiles, are traded in this way, dealers (or market makers) are most common in financial markets whose major function is to provide traders with immediate transactions (liquidity) [16]. Brokered markets cannot guarantee that orders will be executed promptly. This uncertainty with respect to speed of execution may create price risks. While a broker is searching out a compatible trading partner for a client, the prices of the goods may change and the client may suffer a loss. Dealers earn their revenues by selling goods at an ask price higher than the bid price they paid for goods. The difference between a dealer's quoted ask and bid price is called the bid-ask spread in financial markets [7].

2.4 Auction markets

In brokered and dealer markets, one can not guarantee that the transaction could not be improved upon by contracting another broker or dealer. Bids and offers submitted to a broker are subject to the *luck of the draw:* the transaction depends on the pool of information held by the broker, rather than the market forces. Similarly, buyers and sellers in dealer markets have to bear the costs in searching out the best dealer. Furthermore, traders have to pay expensive brokerage commissions or dealer's bid-ask spreads. It would be advantageous to market participants if they could trade directly whenever possible without middlemen. Auction markets provide centralized procedures for the exposure of purchase and sale orders to all market participants simultaneously. By doing so, they virtually eliminate the need for middlemen to locate compatible partners and to bargain for a favorable deal.

In general, one single vertical market shows a mixture of different market structures. In auction markets for commodity spot trading, for example, buyers are usually middlemen who purchase products to sell, as either brokers or dealers, to retailers. Similarly, market participants in Japanese car auctions are dealers in used-car markets [28]. In securities markets, investors at trading floors are most

likely brokerage firms trading for their clients' accounts. These brokers execute transactions with dealers in open outcry auction markets [22]. Nevertheless, the taxonomy provides insights into how IT transform market structures, since most electronic markets focus on a core market process in the value-added chain.

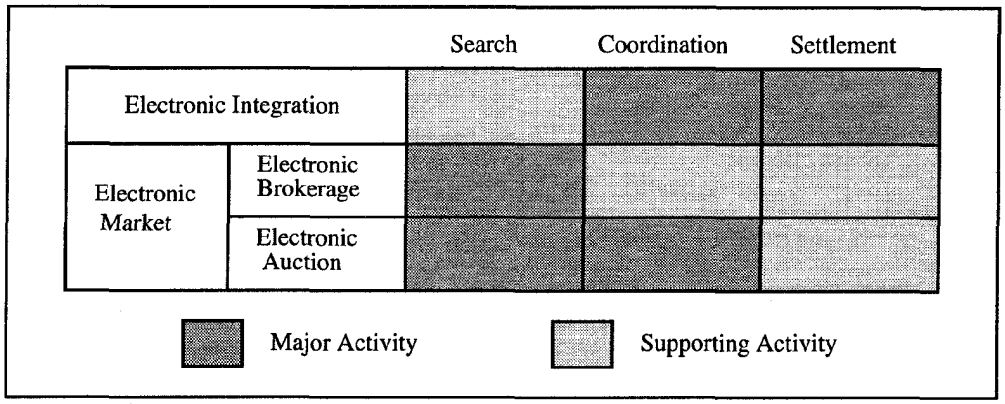

Figure 1: Major and Supporting Activities in Market Transactions

3. Transaction costs and electronic markets

3.1 Transaction costs and electronic integration

Innovations in information technologies over the last two decades have radically reduced the time and cost of processing and communicating information. The use of this electronic communication allows companies to take advantage of two types of inter-organizational information systems: electronic integration or electronic markets [21]. When a supplier and a procurer use information technology to create joint processes in value-added chains, they are taking advantage of the electronic integration effect. The electronic market effect occurs in the case of computer-based markets where information technologies serve as intermediaries between multiple buyers and suppliers.

Every market transaction consists of search, coordination and settlement. Search costs reflect the time and money spent by a trader to obtain information on trading counterparts that best fit his or her preferences. For certain suppliers, search costs occur in the form of advertisements by which they broadcast their product and service offerings to prospective customers. Once one or a few trading partners are chosen, the next step is coordination, an effort by trading parties to increase their resource utilization and value. If buyers and sellers fail to reach an agreement on transaction terms, negotiations may have to be repeated many times before the contract is finally formulated. The coordination costs refer to costs incurred to reach an agreement with a prospective trading partner, and thus include negotiation and contract formation costs. The trade settlement clears the transactions through physical exchanges of goods and accompanied payment. This last phase consists, in some cases, of various sub-transactions with transport companies and financial institutes.

Electronic integration exists in bilateral settings where a relationship between a supplier and a customer has already been established. Thus the economic incentives behind its introduction are concentrated on coordinations and settlements, instead of searches for trading partners (see Figure 1). Electronic integration can improve coordination between a customer and its supplier, creating efficiencies such as better management of inventory levels (*just-in-time operations*). In general, firms involved in electronic integration maintain tightly coupled relationships with a limited number of long-term partners because of high coordination costs [5]. Bakos and Brynjolfsson note that non-contractible investments, which are difficult to specify in advance in a contract, represent significant coordination costs and result in a small number of trading partners [3]. Buyers limit the number of suppliers in order to provide the remaining suppliers with sufficient bargaining power and incentives to make non-contractible investments.

During the trade settlement phase, physical exchanges of goods are accompanied by financial transactions. In general, the amount of the information exchanged in the settlement is bigger than that exchanged in other phases, due to the increased number of parties involved: supplier, customer, shipping company, bank, and insurance company. The complexity is increased when goods and money cross a country's border. EDI systems for global trading, such as Singapore's TradeNet and Hong Kong's TradeLink, are examples of electronic integrations that aim to manage and control the global logistics of the opposite flow of goods and money in the settlement phase.

3.2 Dichotomy of electronic markets

We divide electronic markets into electronic brokerage and electronic auction. The dichotomy comes from an analysis of the extent to which market activities are assisted by these systems along the three transaction phases. The main functionality of the electronic brokerage is to help customers compare offerings from many vendors in order to find a good match for their specific needs with regard to product attributes, service, price, and other factors. Thus electronic brokerage in principle emerges to support the search phase. Electronic auction attempts to assist the coordination as well as the search, by extending its service to automatic contract formations (see Figure 1).

In many cases, customers who obtain information on product offerings from an electronic brokerage still rely on traditional means of coordination and settlement. Home buyers in France, for instance, narrow down prospective candidates for final visits by browsing property lists in the UCB's (Union de Credit Pour Le Batiment's) Electronic Mortgage Broker System. The coordination for the final contract formation is done by face-to-face or telephone negotiations. A certain group of electronic brokerage systems, such as SABRE or CompuServe's Electronic Mall, allow buyers not only to search for the best product offering but also to place purchase orders. In addition, these systems typically support the trade settlement as well through electronic payments for purchased goods. Although these systems may ultimately influence the price of goods, they do not provide a trading mechanism to determine the market price of goods, which is an essential part of the coordination. Most of them adopt posted-offer pricing: that is, a supplier lists his or her ask price and buyers decide how many items to buy at the posted price [26].

In contrast to electronic brokerage systems, electronic auction systems automatically formulate contracts by discovering the market price of goods. Traders electronically expose their bids and offers to multiple potential trading partners and computer-based market systems create transactions by discovering market prices of goods on the basis of those demands and supplies. Since the trade-governing rules used for price discovery are agreed upon by all market participants, traders are obliged to comply with the transaction results. Although this trade rigidity seems to be disadvantageous to traders on the surface, it actually provides strong merits to certain markets where traders otherwise would face price uncertainty and opportunistic behaviors of middlemen. Since information on counter-parts is available before traders place bids and make offers, the market activities assisted by electronic auction include both search and coordination. Many electronic auction systems also serve as a clearing house for trade settlements by ensuring that electronic payments are made before delivery of goods or transfer of titles.

Various forms of trade-governing rules for contract formulation are being adopted by electronic auction systems. The most important of all is the market price discovery mechanism. TELCOT, an electronic auction system for cotton trading in the United States, displays cotton lots for sale and accepts bids from cotton buyers. TELCOT then closes bidding and awards the product to the highest bidder [19]. Electronic auction systems for agricultural products, such as EASE [4] and HAM [24], use computerized matching rules similar to a Dutch auction. In these systems, the price of goods decreases until the bid is registered. If more than one buyer place bids, the price is automatically incremented by a certain amount until only one bidder remains. Electronic auction systems for financial issues, such as CATS, Instinet and Globex, determine the market price using double continuous auctions, where orders to buy and to sell are matched against standing counter-orders based on certain priority rules [9].

4. Changing market structures

4.1 Shift from direct search market to brokered market

The introduction of electronic brokerage shifts direct search markets into brokered markets. Acting as a broker between suppliers and customers who otherwise would have to search out each other by themselves, the electronic brokerage systems significantly reduce search costs that traders have to bear to obtain information on potential trading partners [1]. As a result, buyers are better informed about the available products, being able to purchase goods that better suit their needs. In addition, the reduction of the search costs ultimately brings the price down, since sellers can maintain prices at equilibrium substantially above their marginal cost under high search costs. Buyers in electronic brokerage will enjoy lower prices due to increased competition among suppliers.

Computer on-line shopping systems are typical examples of electronic markets that create a new brokered market. CompuServe's Electronic Mall offers consumers a wide range of product and service offerings that can be purchased on-line. Prodigy, a joint venture of IBM and Sears, allows consumers to compare offerings from various vendors and to complete an electronic order to buy their preferred products [14]. FAST, a computer network broker for electronic parts and components, invites customers to request quotes and to place orders via commercial networks [23]. Once a customer sends a request to FAST, the system distributes the request among relevant vendors and receives quotes from these vendors. Thus FAST eliminates the need for customers to contact a large number of vendors directly. TV home shopping systems can also be viewed as an electronic brokerage since they offer competitive prices and product information to consumers. With the advent of interactive home shopping, which is under experiment by Viacom and Time Warner, TV home shopping will bring many of the current retail markets into the electronic brokerage system.

Computer-based markets sometimes create an electronic brokerage in dealer markets where consumers have to search directly for the best dealer. In the past, jewelers had to call many dealers to find gemstones that match their clients' requests in terms of color, grade and price. Thanks to the AGMS (American Gem Market System), where gemstone dealers list their inventory available for sale, jewelers can easily locate gemstones according to client specifications [29]. In financial dealer markets, NASDAQ displays dealers' quoted prices on a widely distributed electronic billboard system so that customers can execute transactions at the best dealer bid-offer quote for OTC (over-the-counter) securities trading. The London Stock Exchange also introduced a similar system called SEAQ [11]. These systems have significantly reduced dealers' profit margins by increasing competition among dealers.

The reduction of the search cost is likely to destabilize suppliers' profitable outcomes, thereby reducing seller profits, as in the case of NASDAQ and SEAQ. However, the electronic brokerage systems provide suppliers with other incentives to join the system. By moving *on-line* through electronic brokerage, suppliers can broadcast their products or services to a large number of prospective customers simultaneously. For instance, by joining Home Shopping Networks and QVC, vendors can reach 60 million households. Suppliers joining CompuServe can distribute their product offerings to more than two million subscribers. Once its competitors join the system, it becomes a strategic necessity for a vendor to offer its products in a similar electronic brokerage system.

4.2 Shift from middlemen market to auction market

The introduction of the electronic auction can shift brokered or dealer markets into auction markets. The economic benefit gained by this shift is lower market coordination costs compared to those of middlemen markets. Since the pool of information on potential trading partners is diverse among brokers, the expense to locate an appropriate broker is paid by traders. Similarly, dealers do not quote identical prices for an item, either because they disagree as to its value or because they have different inventory objectives: thus it is incumbent upon traders to search out the best quotations for their transactions. In addition, traders have to bear expensive brokerage fees or bid-ask spreads for their services, that would be unnecessary if they executed trades directly with each other. The electronic auction substantially reduces coordination costs by allowing transactions to take place without middlemen.

Traders in brokered and dealer markets also have to bear implicit coordination costs, that are incurred by the opportunistic behavior of middlemen. Opportunism by brokers or dealers becomes possible because of the information asymmetries or bargaining power imbalance between traders and market specialists [5]. Since brokers charge a commission on the basis of sales, there is always the possibility that brokers might collude to set an unfair price, if information asymmetries prevent traders from monitoring the market process. A small number of big middlemen are often strongly linked together to manipulate the market prices at the expense of consumers or suppliers. Traders in middlemen markets face the risk of unfair prices since product prices are often determined apart from market prices that otherwise would be fixed on the basis of supply and demand. This risk of opportunism by middlemen is virtually eliminated in an electronic auction, where public and open bidding systems are used to execute trades without any discrimination to participants.

Before TELCOT was introduced, cotton farmers had to rely on the gin (i.e., broker) to sell a specific lot of cotton. It was common that the gin, eager to secure the transaction to receive a commission for arranging the sale, set a unfair price for cotton farmers [19]. On the other hand, farmers, interested in knowing what their cotton was worth, would have the buyer engage in the lengthy process of negotiation with no intention to sell. TELCOT essentially eliminated these problems by adopting a publicly open electronic bidding system. In TELCOT, producers can distribute information on their supply lots to many buyers and can sell them to the highest bidder. For the buyer, the system provides immediate access to a large portion of the world's available cotton. Because of the speed at which transactions can be completed, prices are relatively unaffected even when a buyer urgently needs a substantial amount of a certain quality of cotton. With a much lower commission than that charged by a broker, TELCOT allows traders to execute transactions at a price determined by market forces.

HAM changed the fundamental nature of pig trading in Singapore from one based on brokers to an open market bidding system [24]. In the past, importers (brokers) had control over access to market information because of the links and contracts they had with both sellers and buyers. A few big brokers, which were tightly connected with each other to prevent new entrants, acted like a cartel by controlling the supply and manipulating prices. Since the information regarding local pig trading resided within the group of brokers, they could make substantial profits at the expense of farmers and consumers. HAM shifted this trading structure into an open and public auction system. By doing so, HAM induced competitive market prices for pigs according to their quality, supply and demand. Traders in HAM can get this fair market price at a rate of 3% commission, compared to 7-10% brokerage commissions, thus significantly reducing their market coordination costs.

Most financial exchanges feature specialist markets, where investors trade with market makers (dealers) who have preferred access to information about orders in the market. This privilege of accessing market information, together with bid-ask spreads, is a form of compensation for dealers' affirmative obligation that provides immediate trade execution to investors [6]. The electronic auction for financial issues and commodity futures, such as CATS, Instinet, INTEX, SOFFEX and Globex, is a market based

on fully automatic order matching and has no specialists (dealers) with affirmative obligations. Investors enter orders into the system, where these orders are usually displayed on trading screens; thus all market participants have fair access to market information. Since buy or sell orders are executed against counter orders without specialists, investors do not have to bear bid-ask spreads, thus curtailing their market coordination costs.

5. Supporting current market structures

5.1 Electronic brokerage systems for middlemen

Electronic brokerage does not necessarily create a new market form. In certain industries, electronic brokerage systems emerge to help middlemen, thus intending to support an existing brokered market without shifting its structure. In these cases, brokers will find their incentives to join the system from economies of scale. Brokers may subscribe to specialized publications or electronic devices announcing bids or offerings on a wide variety of items. They can join the system with a fixed initial cost, but with a low marginal cost per contract. The marginal cost of acquiring information from such media is in many cases insignificant. Thus, brokers join the system to use the electronic brokerage as an important marketing source as well as to obtain substantial economies of scale.

Building an electronic brokerage system typically requires large capital investments, which most small brokerage firms may lack individually. Thus, electronic brokerage systems are in general initiated by firms which have enough resources to sustain large system development and maintenance costs. These initiators find their own motives in economies of scales and scope: after bearing large system development costs, they will face relatively small incremental costs as new participants join the system, thus obtaining substantial economies of scale. Furthermore, technological and organizational resources and expertise acquired during the development and operation of one system may be transferable to other systems, resulting in economies of scope [2].

In France, the Electronic Mortgage Brokerage System (EMBS) is operated by UCB, who finances the construction and rental of buildings [25]. Real estate agents access the UCB to find a match to their own lists of prospective buyers to the UCB listings. The UCB implemented this system to make profits out of the economies of scale. In the past few years, around 900 real estate agents have subscribed to this service, which now lists more than 85,000 properties. Real estate brokers recognize that they can attract more clients by the EMBS subscription which incurs reasonable initial costs, and very low marginal costs for each additional transaction. In mortgage loan markets in the United States, the National Association of Realtors (NAR) introduced Realtors National Mortgage Access System for use by member realtors to provide their clients with lender/loan selection and application services. NAR initially ran the system as a non-profit service for its members. However, as the system grew into a service with more than 100 lenders and 2,000 loan programs (and over $1 billion in loan volume), NAR was able to turn its system into profit-generating service [15].

Computer Reservation Systems (CRS) in the airline industry prove that the economies of scale and scope play an important role as an economic motive for initiators. In the early 1980s when most flight operators suffered from declining profits due to severe competition, airlines that pioneered reservation systems enjoyed high profits from system-related revenues [8]. These profits clearly resulted from the economies of scale. By mid-1994, five major CRSs existed in the world: Galileo International (combining the Apollo and Galileo system), SABRE, Worldspan, System One and Amadeus. Currently reservation systems are also being installed by other travel and tourism principals, in particular large international hotel chains, car rental companies, travelers checks providers, and operators of railways, ships and ferries. A number of these systems have been linked to the main airline reservation systems, thus making them global electronic market systems, for a broad range of travel and tourism products. With this trend, early movers of CRSs are discovering economies of scopes by which they can leverage their know-how in different industries and defray their development expenses among several systems.

5.1 Electronic auction systems for existing auction

The electronic auction systems, which support or compete with traditional auctions instead of creating a new market structure, aim to decouple product flow from the current auction process. In conventional auction markets, suppliers bring their products to the auction place. Buyers wishing to purchase goods also need to be present at the marketplace. Goods sold in auctions are then handed over to buyers. Thus, product flows are coupled with the market (auction) process. Economic efficiencies can be gained when information flows for the auction process are decoupled from the product flows. Since goods are delivered after on-line transactions, more efficient logistics can be arranged. The direct shipping from suppliers to buyers can eventually benefit auction organizations, since they can enlarge their transactions without expanding physical infrastructures. Furthermore, buyers, who used to obtain information on product offerings only upon the announcement of an auction, can access this information in advance. This is a substantial benefit to buyers (wholesalers) who sell purchased items to retailers, because they can predict supplies (from auction) and demands (from retailers) to come up with better bidding strategies.

In Japan, used cars were previously sold at 140 auction sites, where buyers and sellers convened together. Sellers had to bear high transportation costs to move a car to the auction site, and back again if it was not sold. About 45% of cars brought to the auction sites remained unsold. In addition, it was becoming increasingly difficult and costly

for auctions to expand spaces in metropolitan areas. The AUCNET system was designed to resolve this problem by separating the auction process from the transportation of cars. In AUCNET, cars are sold using video images, text-based data, and a standardized inspector's rating [28]. A car sold by AUCNET remains at the seller's location until the transaction is completed. A transport company then delivers the car directly to buyer's location. EASE, an electronic auction system in United Kingdom for trading agricultural products, such as cattle and grain, also attempts to decouple product flow from the traditional auction process [4]. Products are only moved after being sold. Since buyers are able to schedule the routes of their vans and lorries more effectively, transportation costs are significantly reduced. Thanks to the decoupling, EASE could also enlarge its geographical scope, creating a national market in contrast to the regional markets of traditional auctions.

The largest number of transactions of cut flowers and potted plants in the world takes place in the Netherlands, where seven auction markets play an important role in controlling global supplies and demands. In current auctions, sellers are not allowed to specify their reservation prices. Once cut and brought to the market, flowers should be sold whatever the market price is, since they are perishable goods. Decoupling allows growers to specify their reservation prices, since their flowers have not yet harvested at the time of the auction [18]. With decoupling, buyers such as wholesalers and exporters can devise better bidding strategies since they can communicate in advance with retailers on the basis of an electronic product database. Auction organizations also have a strong motivation toward the decoupling. They can accommodate ever increasing trading volumes (annual growth rate of 10%) without expanding their physical infrastructure. Recognizing the benefit of the decoupling, VBA (Verenigde Bloemenveilingen Aalsmeer), the largest auction (with 43% of the market share) located near Amsterdam, launched Information Auctioning in 1994 as a first step toward decoupling [27]. The current Information Auctioning still use samples displayed during the auction, but its next step will be to achieve economic efficiencies by fully decoupling product flows from the auction process.

6. Social and organizational barriers

Although successful electronic markets exist in several industries, the implementation of electronic markets is not always successful. Electronic markets sometimes fail or their penetration pace is often slower than projected at the time of their introduction. There are social and organizational barriers as well. Successful deployment of electronic markets requires considering these barriers along with the economic benefits.

6.1 Resistance from affected parties

Firms affected adversely by an electronic market can be expected to resist and fight against the system. In particular, if electronic markets aim to bypass middlemen by shifting market structures, they are likely to encounter retaliation or resistance from those who are threatened to be squeezed out of the process. The use of HAM undermined the power and market control of brokers and reduced their earnings in pig trading, since farmers could bypass importers to sell their pigs directly to HAM. Thus, when HAM was introduced, brokers understandably protested against the system by introducing a boycott and legal injunction to stop HAM [24]. The government, convinced that the transition to open market trading would ultimately benefit local consumers, had to resort to regulatory powers to overcome the brokers' court injunction that would have killed the HAM system.

Retaliation is more likely when there are many firms whose power is relatively equal or when affected parties are able to unite against the initiating firm, as in the case of HAM. Real-time price-quotation systems, such as SEAQ and NASDAQ, have diminished or wiped out the profits once enjoyed by dealers. When a similar system was proposed for the Eurobond market, big dealers led by Salomon Brothers successfully blocked its implementation [10]. Electronic auction systems, such as Instinet or Globex, eliminate the privilege of dealers to access the order book by making market information available instantly to all subscribing investors. Furthermore, these systems allow investors to bypass dealers since transactions can take place directly between investors. Thus, market specialists have been opposed to an open trading system, significantly slowing down the penetration pace of electronic auction systems [22]. By contrast, mortgage loan brokers in the United States failed to fight against computer loan organization systems which obviously threaten their existence [15]. Small players in mortgage loan industries who do not have strong market powers remain as victims of computer loan organization systems that connect realtors with mortgage lenders without brokers.

Retaliation can also be expected when a new system competes against existing market systems without changing the market structure. When AUCNET started, the association of used car dealers, who controlled most traditional auctions, felt that their many auction sites were threatened, and thus formed a committee to counter against AUCNET's development [28]. The association warned that its members would be deprived of membership if they joined AUCNET. When the association realized it could not block AUCNET effectively any more after the government intervened, it introduced a similar and competitive system called VAN8000. All these examples suggest that a clearly developed strategy to deal with potential retaliations be part of any plan to implement electronic markets. Without such a strategy, the initiating firm may be caught without an appropriate response and jeopardize the investments made.

6.2 Network externality

Network externality can affect the dynamics of the introduction and adoption of electronic market systems [17]. The benefits realized by individual participants in an electronic market system increase as more organizations join the system. When a new system is introduced, network externality becomes an important factor. Without a critical mass of users, it is not only unlikely to spread its use, but also likely to be extinguished altogether. One of key issues for the successful implementation of electronic markets is the planning of strategies to obtain a critical mass of early adopters so that the system will be given a fair chance of success.

When HAM was introduced, the government (owner of HAM) played an important role to increase the system usage to a critical level where the desired system impacts could begin to take effect. In an attempt to boost the use of HAM, the Singapore government announced a new regulation requiring that all pig importers be licensed before they are allowed to import pigs for sale in Singapore. A key licensing requirement was that all pig importers must sell at least 20% of their pigs through HAM. The proportion of pigs traded through HAM progressively increased as more importers and merchants joined the system. Thanks to this new ruling, pig trading through HAM accounted for half the market two years after HAM's implementation [24]. By contrast, Information Auctioning for cut flowers is still lagging behind its intended market penetration rate due to the lack of network externality. When it was started in 1994, only a small number of sellers and buyers put their orders into the system. Despite its advantages over traditional auctions, the benefits of shifting their trading to this new market form were not strongly felt by participants, mainly because there were not enough counterparts [27].

Although electronic markets are making inroads into financial market places, their diffusion is much slower than expected. Investors who take their orders to a new, less active, and less liquid market face two economic penalties: uncertain execution and liquidity penalty [6]. In the absence of significant order flow, it is uncertain when their orders will be executed. In addition, attempts to buy and sell in an inactive market may create an imbalance of demand and supply, harming prospective buyers and sellers. The economic benefits (reduced transaction costs) of a new electronic market may not be sufficient to compensate for the economic penalties of inferior execution, unless the new system provides a network externality enough to induce traders to switch to a new market form. A critical level of utilization is a necessary condition for the impacts of electronic markets to be felt.

6.3 Product standardization and third party role

Low asset specificity and simple product description have been characterized as important attributes of products for electronic markets [21]. The recent development of multimedia technology allows more product groups to be traded electronically. Many electronic markets, including Prodigy's Electronic Mall, EASE and AGMS, are actively moving to convert text-based product catalogs into multimedia product representations. Although the use of multimedia representation assists buyers in making a purchasing decision, it alone does not eliminate product uncertainty encountered by customers in electronic markets. BVH (Bloemenveiling Holland), the second largest auction for cut flowers trading in Holland, introduced Screen Auctioning where the physical presence of goods is replaced by pictures displayed on a big screen. The system was later deemed to be a failure and its operation was stopped. Similarly, Slide Auction was implemented before the advent of AUCNET by traditional Japanese used car auctions. The Slide Auction, which intended to hold auctions by using color slides, also ended in failure.

We argue that there are two additional features which are crucial for the successful development of electronic markets: (1) a certain degree of standards for product ratings and (2) the presence of a trusted third party for product evaluations. In TELCOT, cotton farmers send six-ounce samples of their supply lots to the Department of Agriculture, which determines the grades of cotton based on standardized measures [19]. The standard attributes assessed by the government allow buyers to purchase cotton before seeing it. Despite the use of multimedia product presentations, the failure of the Slide Auction was due to the lack of standardized inspection ratings. Thus, the emphasis on building standard product ratings for used cars accounts for much of the AUCNET's success [28]. Similarly, recognition of the importance of standards for grading colored gemstones was crucial to success of AGMS. AGMS developed a widely-accepted colored-stone grading system based upon knowledge gleaned from experienced dealers and ColorMaster, a colorimeter manufactured by the Gemological Institute of America [29].

Certain groups of electronic market systems, such as home shopping systems or FAST, include only off-the-shelf products that have their own brand names and are diverse in types. Products sold by these systems do not necessarily require standard ratings, although some systems provide product comparison services among similar items. However, they ensure as a third party that customers can get refunded when purchased goods do not match the products listed in the system. Except for those off-the-shelf products, a certain level of standardization of product ratings, together with the existence of a trusted third party, is crucial in compensating for product uncertainty faced by consumers.

6.4 Value-added services of existing markets

Traditional markets often provide market services that are difficult for electronic market systems to duplicate. Auction markets for agriculture products offer value-added services,

such as quality inspection, product grouping and packaging. Once cut flowers arrive at the conventional auction markets, for instance, they are inspected by the auction's own inspectors (Flower Master) whose remarks represent crucial information to buyers. Decoupling product flows from the market process makes this service challenging. EASE had to adopt a franchise system to continue this quality inspection service: farmers bring their goods to a nearby local franchise office, where their supply lots are inspected [4]. However, distributed franchises are more complex and costly than a centralized market. Another barrier to the decoupling is product sorting services by traditional markets. Farmers in general specialize in one or two types of goods, thus cultivating a few products on a large scale. By contrast, buyers, who are usually sellers in retail markets, purchase a wide range of agricultural goods from several farmers and bundle them into packages for consumers. The benefit of direct shipment from suppliers to buyers is substantially reduced when buyers purchase multiple items, each in small quantities.

Electronic auction systems are often cited to be disadvantageous to traditional open outcry markets, since investors can hardly capture market information available on the trading floor. In financial markets, it is sometimes important to know who is bidding, who is offering and who is trading with whom. This information gives a trader some guidance on the nature of trading activity and price movements. Since open outcry requires all on-the-market bids and offers to be announced publicly, investors in the trading pits can view all trading activity on the floor. By contrast, investors in electronic markets can rarely get this kind of soft information. Furthermore, a fast market, which often occurs after a news event such as a Federal Reserve announcement, is better supported by floor trading than by electronic markets [22]. A trader simply changes a hand signal and makes a brief verbal announcement, and his previous bid or offer is automatically and implicitly canceled. Thus, there often exist certain market functions that are available in conventional markets but are difficult to include in electronic market systems. It is then necessary for initiating firms to convince participants that the economic benefits are attractive enough to compensate for the value-added services of traditional markets.

7. Conclusion

In this paper we expand transaction cost economics to shed light on the emergence of two different electronic market structures: electronic brokerage and electronic auction.

- Electronic markets change existing market structures by addressing transaction costs related to trade phases. Electronic brokerage systems shift direct search markets into brokered markets by reducing search costs, while electronic auction systems shift middlemen markets into public auction markets in an attempt to curtail explicit and implicit costs involved in negotiation and contract formation.

- Electronic market systems also emerge to support or compete with current markets, instead of changing market structures. In this case, economies of scale and scope are important economic forces behind the introduction of electronic brokerage systems. Electronic auction systems pursue economic efficiencies by decoupling product flows from the current auction process.

It should be noted that these economic motives are neither exclusive nor exhaustive. For instance, any initiating firm of electronic market systems will eventually find benefits from economies of scale and scope. Since electronic markets per se support on-line transactions, separating the product flows from the market process is not unique in electronic auctions. Thus, the economic incentive discussed above should be viewed as a relatively compelling one in each case, instead of exclusive one. There are also economic benefits that are not discussed but are shared in common. For example, electronic markets can be around-the-clock global markets and can provide regulatory advantages such as electronic surveillance and auditing [6]. Despite its oversimplification, this analysis provides useful guidelines when one is looking into appropriate forms of electronic marketplaces.

Recent innovations in network infrastructures also contribute to the emergence of electronic markets. As the cost of high bandwidth networks such as ISDN and ATM decreases, the merging of computer-based markets with multimedia product representations has become economically feasible. The advent of interactive TV networks, which aims to achieve two-way and wider-bandwidth communications, is expected to induce more consumers to switch to the electronic markets. Most important of all is the proliferation of Internet use for electronic commerce. Thanks to the Internet, which has become the de facto electronic highway with more than forty million users connected, electronic market systems such as CommerceNet, Web Shops and Internet Malls could be built with relatively low sunk costs [20].

In this paper, we have emphasized the impact of information technologies on market structures. In addition to economic benefits that can be obtained by using information technologies, several barriers are also analyzed, which often prevent the successful implementation of electronic markets: (1) resistance from affected parties, (2) network externality, (3) the lack of standard ratings by third party, and (4) reliance on value-added services by existing markets. Some of these barriers require social and organizational considerations beyond the economic issues. Others need to consider the tradeoffs along with the economic benefits. As Hess and Kemerer [15] pointed out, no single variable-based theory, even if intuitively appealing, can successfully predict phenomena as complex as market structures. We suggest, however, that

the dichotomy of electronic markets, together with the decomposition of transaction costs, helps us analyze the impact of IT on market structures and provides guidelines for further empirical studies.

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